

AMENDMENTS TO THE CLAIMS

Upon entry of the present amendment, the status of the claims will be as is shown below. This listing of claims replaces all previous versions and listings of claims in the present application.

Listing of Claims:

1. (Cancelled)

2. (Currently Amended) ~~The~~ An image processing device ~~as set forth in~~
~~claim 1~~, further comprising:

a light source configured to irradiate a light intensity-modulated at a modulation frequency to a target space;

a light receiving element configured to receive the light reflected from an object in the target space and generate an electrical output corresponding to an intensity of the received light;

an image generator configured to generate a distance image having pixel values, each of which provides a distance value between the object and the image processing device, in accordance with a phase difference between the light emitted from said light source and the light received by said light receiving element, and a gray image having pixel values, each of which provides a gray value of the object, in accordance with the intensity of the received light;

a differentiator configured to generate a distance differential image having pixel

values, each of which provides a distance differential value, from said distance image, and a gray differential image having pixel values, each of which provides a gray differential value, from said gray image; and

an outline extractor configured to extract an outline of the object by use of said distance differential image and said gray differential image.

3. (Currently Amended) The image processing device as set forth in claim 2, wherein said outline extractor extracts, as the outline of the object, a ~~region(s)~~ first region where said distance differential value maximizes in said distance differential image, and a ~~region(s)~~ second region where said gray differential value maximizes in said gray differential image.

4. (Currently Amended) The image processing device as set forth in claim 2, wherein said outline extractor determines a first ~~region(s)~~ region where said distance differential value maximizes in said distance differential image, and a second ~~region(s)~~ region where said gray differential value maximizes in said gray differential image, and then extracts a corresponding ~~region(s)~~ region between said first ~~region(s)~~ region and said second ~~region(s)~~ region as the outline of the object.

5. (Currently Amended) The image processing device as set forth in claim 2, wherein said outline extractor extracts, as the outline of the object, at least one of a ~~region(s)~~ first region where said distance differential value is ~~not smaller than~~ equal to or more than a threshold value in said distance differential image, and a ~~region(s)~~ second region where said gray differential value is ~~not smaller than~~ equal to or more than a

threshold value in said gray differential image.

6. (Currently Amended) The image processing device as set forth in claim 2, wherein said outline extractor determines a weighted sum of said distance differential value of each of said pixels of said distance differential image and said gray differential value of a corresponding pixel of said gray differential image, and then extracts a region(s) region where the weighted sum is ~~not smaller than~~ equal to or more than a threshold value as the outline of the object.

7. (Currently Amended) ~~The~~ An image processing device ~~as set forth in claim 1,~~ comprising:

a light source configured to irradiate a light intensity-modulated at a modulation frequency to a target space;

a light receiving element configured to receive the light reflected from an object in the target space and generate an electrical output corresponding to an intensity of the received light; and

an image generator configured to generate a distance image having pixel values, each of which provides a distance value between the object and the image processing device, in accordance with a phase difference between the light emitted from said light source and the light received by said light receiving element, and a gray image having pixel values, each of which provides a gray value of the object, in accordance with the intensity of the received light,

wherein said image generator generates said gray image in a time-series manner, and the image processing device further comprises a differentiator configured to generate

a gray differential image having pixel values, each of which provides a gray differential value, from said gray image, and an object detector configured to detect the object by use of said gray differential value and said distance value.

8. (Currently Amended) The image processing device as set forth in claim 7, wherein said object detector generates a difference image between a pair of gray differential images, which are generated from two gray images obtained at different times, extracts a region(s) region where each of pixel values is ~~not smaller than~~ equal to or more than a threshold value in said difference image, and then detects said region(s) region as the object when a representative value of the pixel values of said distance image corresponding to said region(s) region is within a predetermined range.

9. (Currently Amended) The image processing device as set forth in claim 7, wherein said object detector generates a plurality of difference images, each of which is a difference between two of at least three gray differential images generated from at least three gray images obtained at different times,

extracts a region(s) region where each of pixel values is ~~not smaller than~~ equal to or more than a threshold value with respect to each of said difference images to obtain binary images, performs a logical operation between each of pixel values of one of said binary images and a corresponding pixel value of another one of said binary images to extract a common region(s) region therebetween, and

detects said common region(s) region as the object when a representative value of the pixel values of said distance image corresponding to said common region(s) region is within a predetermined range.

10-13. (Cancelled)

14. (Currently Amended) ~~The~~ An image processing device ~~as set forth in claim 1,~~ further comprising:

a light source configured to irradiate a light intensity-modulated at a modulation frequency to a target space;

a light receiving element configured to receive the light reflected from an object in the target space and generate an electrical output corresponding to an intensity of the received light;

an image generator configured to generate a distance image having pixel values, each of which provides a distance value between the object and the image processing device, in accordance with a phase difference between the light emitted from said light source and the light received by said light receiving element, and a gray image having pixel values, each of which provides a gray value of the object, in accordance with the intensity of the received light;

a reference-pixel detector configured to detect, as a reference pixel, ~~[[the]]~~ a pixel having a minimum distance value in a predetermined region in said distance image;

a pixel extractor configured to set a specific region including said reference pixel in said distance image, and extract a group of pixels each having the distance value within a predetermined range from said specific region; and

an exposure controller configured to control a sensitivity of said light receiving element in accordance with the gray image having the pixels, each of which has a one-to-one correspondence with one of the pixels extracted by said pixel extractor.

15. (Original) The image processing device as set forth in claim 14, wherein a lower limit of said predetermined range is the distance value of said reference pixel, and an upper limit of said predetermined range is determined by adding a required value to the distance value of said reference pixel.